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# Boulevard as Natural Skeleton Element of Modern City

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**Abstract.** The implementation of spatial planning environmental principles is becoming increasingly relevant due to the renewed environment state. In this context, boulevards are regarded as an integral element of the natural city skeleton, the building process of which is aimed at the environment improving. Empty boulevards in modern cities are considered to be the main problem on the way to this goal achieving. The research analyzes the process of boulevards historical evolution and identifies the main factors that have affected the loss of their sustainability in modern cities. The boulevard noise level was calculated proving the inconsistency of modern traditional boulevards with the requirements of a comfortable environment. Based on the identified features and problems of modern boulevards, town planning recommendations are being developed that contribute to the formation of the stability of boulevards in modern cities.

**Keywords:** boulevard, natural skeleton of city, pedestrian promenade spaces, ecological problems, transport problems, boulevard culture, comfortable environment.

## 1. Introduction

The movement for green planet and urban sustainable development is actively promoted nowadays. To achieve this goal the urban natural skeleton is considered to be the integral city-forming element [1]. A boulevard is also referred to inter-neighbourhood elements of the urban natural skeleton mesostructure [2]. They are constructed, designed and developed in big cities and consequently are supposed to affect the ecological situation. Nevertheless, from the environmental point of view their impact is not enough since their development pattern and the concept inherent in the very notion are not designed for significant greening and in general fulfil different functions. By absorbing deeper in the history, original functions of a boulevard resulting in the loss of their sustainability in the world of today will become apparent.

## 2. Relevance of the study of boulevard sustainability in a modern city

Modern researchers mark the need for creating urban pedestrian spaces being one of the priority areas in the present urban planning and urban-planning reconstruction [3]. Such spaces provide the solution to transport and ecological problems in cities; contribute to the preservation and restoration of urban fabric integrity and to the adaptation of existing structures to modern functions; and bring together social and commercial effectiveness of the urban environment [4]. A boulevard is also an integral element in such system of pedestrian promenade spaces [5].

However, these theoretical advantages of a boulevard are neglected in practice and the existing boulevards are simply empty in most big cities. Why are boulevards aimed at solving ecological



problems and bringing together social and commercial effectiveness of the urban environment losing their ground?

The article examines the historic experience of forming and developing boulevards, the state-of-the-art in order to reveal their features and problems in modern cities. On this basis, the aim of the study is to develop urban-planning recommendations on the boulevard sustainability formation in a modern city.

### 3. Historical background of boulevards

A boulevard is an alley or a path often used as a promenade, usually along a wall or a city street (originally in Paris, and since the end of the nineteenth century in other cities) [6]. The definition contains the origin of boulevards: originally, they emerged in place of former city walls, which were no longer required with time. The word was borrowed from French – “boulevard”, which arrived from German – “bolwerk” that means “vallum”. The custom to create alleys lined with grass plots, trees and bushes in place of abolished vallums came from France [7].

In the epoch of classicism, boulevards took well-established simple forms presented at that time. A boulevard was a wide alley along or in the middle of a city street with trees along each side, used as a promenade [8]. One of the oldest and most famous boulevards was Tverskoy boulevard in Moscow. In 1774, Ekaterina II ordered to destroy the rundown walls of the White City, which protected the city for 200 years, and create boulevards instead. Thus, the first boulevard in Moscow appeared in the summer of 1796, under Paul I. The boulevard became the favourite place for strolls and meetings among “decent people” [9].

In the nineteenth century, there already appeared the boulevard culture. The boulevard became the centre of cultural life, the “Green club” for the noble, where the high life boiled up. Flower beds, fountains, foot-bridges and green pavilions were established on boulevards. Military band played the music. There were bakeries, shops and other public catering enterprises along pedestrian routes [10]. Hence, the boulevard of that time served as:

- promenade – basic function;
- social contacts;
- trade;
- communication with natural environment;
- cultural education.

The 1917 Revolution led to the democratization of the society in Russia. The society being now secular (rather than religious) needed to spend somehow their time which was earlier devoted to going to church. Boulevards became the places of democratic inclusion of people in nature that undoubtedly affected boulevard popularization. The basic function of boulevards in those days was still promenade – flânerie movement representing the phenomenon of urban behaviour.

### 4. The problem of boulevard implementation in a modern city

Nowadays, there is a problem of empty boulevards in modern big cities (figure 1). Where once boulevards enabled people to be in the centre of all the urban life actions, today boulevards are meant to provide a shelter from hustle and bustle of a city [11]. A boulevard creates a space figure of suspension – this is the street where a man walks inside and, at the same time, by the side of a city; this enables one to look at a city as if from a park, from behind trees.

The question is: why have boulevards failed to be in demand? Why do people prefer trade centres or parks, at most, to boulevards?

Having examined the evolution of boulevards within a historical context, the boulevard transformation under certain social scenarios of urban life has become evident. The changes in lifestyle, the development of science and technique resulted in global changes in the entire human life system influencing all aspects of social life. Major transformations occurred in the entire system of culture and modern civilization. Thus, one can emphasize the following aspects influencing the boulevard sustainability in a modern city:

- transport;
- culture;
- functions.



**Figure 1.** The central boulevard in Yekaterinburg city.

#### 4.1. *Transport problems*

The “life” of boulevards was directly affected by automobilization that resulted in the congestion of urban road-street networks [12]. The existing formerly boulevard with typical flaner movement aimed at contemplating the surrounding nature and communicating socially has transformed to green transit space. When in such space, there appears the overwhelming desire to escape as quickly as possible. The noise from passing automobiles and the air polluted by the exhaust fumes are hardly conducive to the creation of comfortable environment. Besides, trees at the sides intended to demarcate the space and to protect from the bustle are unable to make things better.

#### 4.2. *Boulevard culture*

The nineteenth century boulevard caused the foundation of the boulevard culture. The term “boulevard culture” came from the theater when in the seventeenth-eighteenth centuries private theatres were opened on the French boulevard du Temple. Cinematography was known to originate on French boulevards at the end of the nineteenth century [13]. The boulevard culture embodying mass culture in a way was of tremendous significance at that time.

Present boulevards have lost its culture having become green transit spaces. The boulevard culture gradually disappeared from this “space” as all elements, the culture consisted of, had disappeared as well. The relation between the boulevard culture and the mass one explains at some point the causes of this loss.

#### 4.3. *Functional problems*

According to the nineteenth century ideas, a promenade was an essential part of human life and the basic function of a boulevard. Promenade movement is varied and requires specially organized urban spaces [14]. Having lost their cultural characteristics because of transport problems, modern boulevards fail to fulfill their immediate function – flaner movement. People prefer parks to boulevards, since the former provide specially organized urban space with the possibilities to walk and communicate with natural environment [15]. Other minor functions of a boulevard are typical now of modern trade centres that completely meet the demands of people in shopping and social contacts [16]. The need for cultural education in modern world has minimized and caused the loss of the boulevard culture.

### 5. **Boulevard renewal methods**

For a boulevard to “live” it should match its historical prototype, i.e. a boulevard should correspond to that originated in the nineteenth century. Accordingly, the following conditions should be observed:

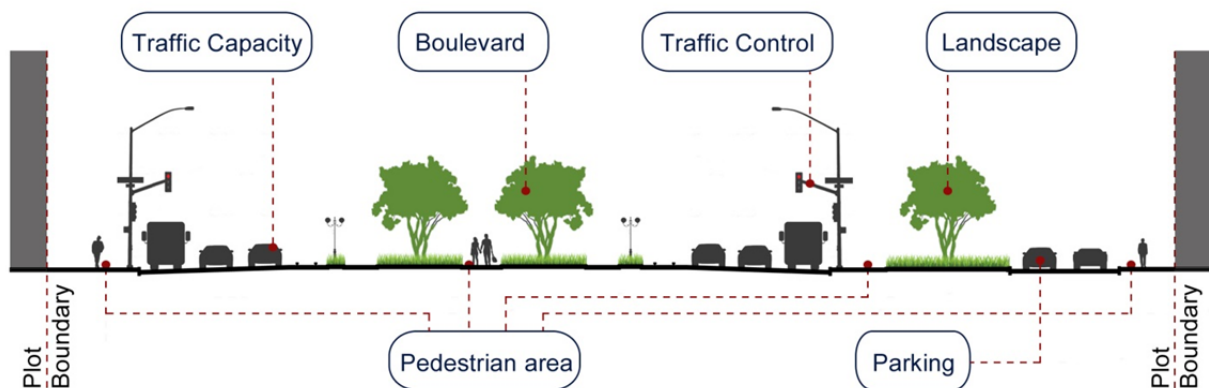
- transport (volume of traffic, recommended noise level);
- the renewal of the boulevard culture (the function of cultural education);

- the reconstruction of minor boulevard functions (social contacts, shopping, communication with natural environment).

Compliance with these conditions will enhance ecological comfort and the popularization of modern boulevards.

### 5.1. Correlation with transport system

Taking the example of one of the boulevards located in the central part of Ekaterinburg, we can see the inconsistency between modern boulevards and the conditions of environmental comfort (figure 2).



**Figure 2.** Cross-section profile of the central boulevard located on Lenin Street, street section from Turgenev Street to M. Sibiryak Street.

Design sound level in the origin is placed at a standard distance equal 7.5 meters from the first centre line of traffic and determined in accordance with transport and planning factors:

$$L_{A \text{ equiv}} = f(N, V, p_{fr}, p_d, p_{tr}, i) \quad (1)$$

where  $L_{A \text{ equiv}}$  = equivalent sound level, 7.5 m from the first centre line of a road, dBA;  $N$  = hourly vehicle density in two directions, natural unit per hour;  $V$  = weighted average speed of transport stream, km/h;  $p_{fr}$  = percentage of freight and public transport in the stream;  $p_d$  = percentage of diesel transport in the stream;  $p_{tr}$  = percentage of trams in the stream;  $i$  = arterial head fall.

The transport stream on Lenin Street in one direction equals 1500 - 2000 automobiles per hour. The calculation of the equivalent sound from the transport stream of the basic street-road network skeleton showed that the sound level on the boulevard accounts for 77.9 dBA (Table 1) exceeding the recommended value at a rate of 55 dBA. Such values do not contribute to the ecological comfort of the boulevard.

**Table 1.** Calculating the equivalent sound from the transport stream of the basic street-road network skeleton of the street section under investigation in Ekaterinburg.

a

Factors						Distance between vehicle
Vehicle density in two directions in natural units, $N$	Weighted average speed of transport stream, $V$ , km / h	Percentage of freight and public transport in the stream, $p_{fr}$	Percentage of diesel transport in the stream, $p_d$	Percentage of trams in the stream, $p_{tr}$	Head fall, $i$ in ‰	
1523	60	19	5	0	11	39

b

Equivalent sound level, $LA_{equiv}$ without correction	Modifications ( $dBA$ )					Equivalent sound level, $LA_{equiv}$ , $dBA$
	Weighted average speed of transport stream, $V, km/h$	Percentage of freight and public transport in the stream, $P_{fr}$	Percentage of diesel transport in the stream, $P_d$	Percentage of trams in the stream, $P_{tr}$	Head fall, $i$ in ‰	
76,43	1,13	-2,04	0,98	0	0,44	77,9

We suggest that the solution to the problem would be to design and construct pedestrian boulevards [17]. They fulfil the basic function of a boulevard – slow flaner movement. This type of a boulevard being an actual public space is possible where the movement is minimized or diverted (entirely pedestrian space, with special vehicle allowed to provide the service).

The new concept of the neighbourhood development in Saint Petersburg completed by the architectural bureau “Studio 44” demonstrates the way to use pedestrian boulevards under residential development (figure 3). The basement of the houses along the boulevard takes the form of loggias combining different functions. The absence of automobiles and the usage of artificially created water surfaces along basic pedestrian routes allow creating friendly and comfortable environment [18].

The above example proves that there is a possibility to renew boulevards. When designing new boulevards, pedestrian ones can be seen as a realistic alternative to traditional boulevards whose “life” was suspended due to the identified problems. The major problem of boulevards under reconstruction is the growing demand for transport [19]. If one fails to solve the transport problem or bring the transport level to standard values, the boulevard transformation into so-called ‘shelter’ for cyclists can be considered [20].

## 6. Conclusions

The evolution analysis demonstrates that boulevards appeared naturally in response to definite social scenarios of urban life and, therefore, remained intact over time. Automobiliation contributed to the congestion of urban road-street networks and negatively affected the “life” of boulevards. The loss of functions and changes in the cultural life of a modern society contributed to the loss of boulevard sustainability in modern cities as well. The identified features and problems of modern boulevards enabled us to develop urban-planning recommendations on the boulevard sustainability formation in a modern city. The problems identified highlight the necessity to reconstruct most of modern boulevards. The recommendations proposed both facilitate the creation of new boulevards and promote the increase in demand and social importance of boulevards.



**Figure 3.** Saint Petersburg. Residential area on the Oktyabrskaya embankment. Concept by “Studio 44”.



## References

- [1] Krasnoshchekova N S 2016 Modernization of town-planning technologies for sustainable development of cities and agglomerations with the introduction of principles of biosphere compatibility *Collection of Scientific Works of Russian Academy of Architecture and Construction Science* (Moscow: Publisher ACB) pp 200–04
- [2] Trukchachev V I 2014 *Environment Safety and Energy Sustainable Development* ed N I Karnilov (Tambov: Pershin R V Publishing house) p 239
- [3] Ferreira I A, Johansson M, Sternudd C and Fornara F 2016 Transport walking in urban neighbourhoods - Impact of perceived neighbourhood qualities and emotional relationship *Landscape and Urban Planning* **150** pp 60–69
- [4] Zakirova Y A 2009 *Urban-planning Reconstruction of the Pedestrian System in the Historical Part of a City* (Moscow) p 186
- [5] Stepanova S K 2006 Systems of public pedestrian spaces. Emergence and development *News* **2** pp 26–31
- [6] Epishkin N I 2010 *Historical dictionary of Gallicisms in the Russian language* (Moscow: ETS Publishing house) p 5140
- [7] Fedosuk Y A 2009 *Moscow in Sadovoye Rings* (Moscow: AST Publishing house) p 610
- [8] Lillebye E 1996 Architectural and functional relationships in street planning: an historical view *Landscape and Urban Planning* **35** pp 85–105
- [9] Milova M F and Pezvin V A 1984 *Strolls in Moscow* (Moscow: Moscow worker) p 398
- [10] Urbach A I and Lin M T 1990 *Architecture of Urban Pedestrian Spaces* (Moscow: Stroyizdat) p 200
- [11] Zakaria J and Ujang N 2015 Comfort of walking in the city center of Kuala Lumpur *Procedia - Social and Behavioral Sciences* **170** pp 642–52
- [12] Strelnikov A I and Ter-Voskanyan O Sh 2016 Ethics of transport modeling *Collection of Scientific Works of Russian Academy of Architecture and Construction Science* (Moscow: Publisher ACB) pp 348–53
- [13] Gusev A V 2008 Protazanov – the pioneer of boulevard cinematography *Cinematography Related Notes* **88** pp 187–92
- [14] Ariffin R N R and Zahari R K 2013 Perceptions of the urban walking environments *Procedia - Social and Behavioral Sciences* **105** pp 589–97
- [15] Starikov A A 2017 Aesthetics of the urban environment and quality of life of citizens *Collection of Scientific Works of Russian Academy of Architecture and Construction Science* vol 1 (Moscow: Publisher ACB) pp 232–35
- [16] Ptichnikova G A 2017 Public, public and private spaces of the modern city: architectural and town-planning development in the context of socio-cultural changes *Collection of Scientific Works of Russian Academy of Architecture and Construction Science* vol 1 (Moscow: Publisher ACB) pp 443–47
- [17] Ernawati J 2016 Dimensions underlying local people's preference of street characteristics for walking *Procedia - Social and Behavioral Sciences* **234** pp 461–69
- [18] Carpenter M 2013 From 'healthful exercise' to 'nature on prescription': The politics of urban green spaces and walking for health *Landscape and Urban Planning* **118** pp 120–27
- [19] Bulavina L V, Payusova M S and Yakovleva M K 2005 Estimation of the perspective plan of the city of Yekaterinburg in terms of the need for transport *Herald of USTU-UPI. Construction and Education: a Collection of Scientific Papers* vol 14 (Ekaterinburg: GOU VPO USTU-UPI) pp 198–201
- [20] DiGioia J, Watkins K E, Xu Y, Rodgers M and Guensler R 2017 Safety impacts of bicycle infrastructure: A critical review *Journal of Safety Research* **61** pp 105–19